of Latimer Clark, Muirhead, and Co. During his period of pupilage he took part in research work on the improvement of the electric arc lamp. In 1883 he entered the service of the Anglo-American Brush Electric Light Corporation, and undertook the installation of numerous electrical plants both in England and on the Continent. In 1888 his company placed him in charge of the erection and maintenance of the electrical equipment at the Brussels Exhibition. The following year he went to South Africa as electrical engineer to the Cape Government Railways, and in 1902 took up the additional appointment of electrical adviser to the Treasury. During the Boer War, and for two years afterwards, he acted as electrical consultant to the Royal Engineers. He became engineer in charge of the electrical equipment at the harbours of Cape Town, Port Elizabeth, and East London, when these were brought under the control of the Government Railways in 1909. He resigned his railway appointment in 1911, when he went to Johannesburg as government inspector of mines. On his retirement from that position in 1923 he returned to London. He was elected an Associate of the Institution in 1891, and a Member in 1897. He served for a time as Local Hon. Secretary and Treasurer for the Cape, Natal, and Rhodesia, and also as Chairman of the Cape Town Local Section.

BERNARD MERVYN DRAKE was born at Malta in 1858 and died on the 5th October, 1931, in his 74th year. He was educated at Rossall School and, after serving as a pupil in Sir Joseph Whitworth's works at Manchester and Gorton, entered, in 1881, the service of the Anglo-American Brush Co. While in their employ he carried out the lighting of the Buen Retiro in Madrid, the first premises in Spain to be lighted with incandescent lamps. He was afterwards appointed engineer to both the Great Western and the Brush Midland sub-companies, and had charge of the earliest power stations at Bristol, Cardiff, and Cleethorpes. In 1884 he was appointed managing director of the Electrical Power Storage Co. and had to solve many problems in connection with the manufacture and use of accumulators. These problems formed the subject of a paper before the British Association in 1886. In that year he went into partnership with the late John Marshall Gorham and founded the firm of Drake and Gorham, of which he afterwards became chairman and managing director. The firm became actively engaged in installing electric generating plants and wiring throughout the country, and contracted for many of the best-known country residences. He was instrumental in putting on the market many useful inventions, such as the Cardew earthing device and the hot-wire voltmeter, and he and Mr. Gorham were the patentees of the spring-contact switch which was used as a standard for many years. He was associated with the development of the Jandus arc lamp and was chairman of the Nernst lamp company until that invention was superseded by the metal-filament lamp. He held the position of consulting engineer to the Bank of England for 25 years and was personally responsible for the large installations at the Prudential Assurance Co., Chatsworth, Alnwick Castle, Crewe Hall, etc. In 1895, in conjunction with Messrs. Gorham and Claude Johnson, he founded the D.P. Battery Co., and later became chairman of the Tudor Accumulator Co. and also of the National Accumulator Co. He was elected an Associate of the Institution in 1883 and a Member in 1886, and served on the Council in 1902–5. At the Commemoration Meetings in 1922 he contributed a paper (see vol. 60) on " Recollections of Early Electrical Engineering." He was for over 36 years a member of the Institution's Wiring Regulations Committee, and was also a member of the Electrical Trades Committee which was appointed by the Board of Trade to report on Trade after the War. As a tariff reformer he had consistently advocated the protection of home trade from foreign competition. He had a striking presence and personality, was undoubtedly one of the small band of influential pioneers who helped to bring the electrical industry to its present outstanding position, and he was invariably associated with any new development. In addition to his many business interests he was a very keen fly fisherman and an excellent game and rifle shot. The writer of this notice was personally acquainted with him since 1888, and greatly esteemed his upright, independent, and sterling character. S. G. C. R.

CHARLES LEAVITT EDGAR, president and general manager of the Edison Electric Illuminating Co., of Boston, Massachusetts, died on the 14th April, 1932, at Atlantic City, New Jersey, at the age of 71. He received his technical education at Rutgers College, New Brunswick, and graduated in 1882. Leaving the college the same year, he was appointed to the staff of the Edison Electric Light Co. as superintendent of the test room at the New York factory, and was promoted in 1884 to the position of assistant engineer in charge of the company's contracts for the erection of central stations. Shortly after his appointment in 1887 as chief engineer of the company, he was transferred to the position of general superintendent of the newly-formed Edison Electric Illuminating Co. of Boston. He saw 45 years' service with this concern, of which he was made general manager in 1889, vice-president in 1894, and president in 1899. He made several trips to Europe in order to study the methods of Continental supply engineers, and as a result of these investigations he introduced into America the use of storage batteries as central station auxiliaries. He also foresaw the importance of compact generating units for stations in congested districts, and installed at Boston the first vertical engines used in America for central station work. On a special visit to England in 1898 he studied the Wright demand system of charging, which was subsequently adopted at Boston. Throughout his life he was a keen student of sociology, and devoted much of his leisure to welfare work among the employees of his company. In 1927 Rutgers College conferred upon him the honorary degree of D.Sc. He was elected a Member of the Institution in 1905.

THOMAS ALVA EDISON, who died on the 18th October, 1931, enjoyed a world-wide reputation as a scientific inventor which has probably never been rivalled. The following statement gives no more than the bare facts

of his wonderful career. He was born at Milan, Ohio, on the 11th February, 1847. He was educated by his mother until, while still a boy, he obtained permission from the authorities to sell newspapers on the Grand Trunk Railway trains. His natural interest in science was stimulated by daily contact with railway engines and the electric telegraph, and he spent the bulk of his earnings on books and scientific apparatus. In his leisure he found time to master the subject of telegraphy, and in 1863 he became a telegraph operator on the Grand Trunk Railway. The following year he joined the Western Union Telegraph Co., and later spent some time in their office at Boston. Here he bought a complete set of the works of Faraday and began to make experiments in electromagnetism. He was granted his first patent in 1869, for an electric vote recorder, but his efforts to get the device installed in the House of Representatives proved fruitless. He therefore determined to devote himself in future to inventions for which there was likely to be a demand. Resigning his post at Boston, he went to New York, where his technical knowledge soon gained him the position of manager of the Gold Indicator Co.'s telegraph plant for informing stockbrokers of prices on the Gold Exchange. The improvements which he made to the system then in use attracted the attention of the Western Union Co., at whose request he undertook experiments with a view to improving their " stock-ticker " instrument—the forerunner of the tape machine. The results of these experiments were embodied in the Edison universal printer, the patent rights of which he sold for $40 000. Thenceforward he was assured of financial independence, and was free to devote himself to his career as an inventor. In 1870 he came to England for the Automatic Telegraph Co., in order to demonstrate their automatic system to the telegraph officials of the British Post Office. He next turned his attention to telephony, and by making use of a carbon microphone in conjunction with an induction coil he evolved the first transmitter which could be used over long-distance lines. In 1879 he produced his loud-speaking telephone and sent representatives to introduce it into Great Britain, where it achieved some measure of success. Edison's pet invention, the phonograph, originated in 1877 as the result of some experiments with the automatic telegraph. The popularity of the early type of instrument, in which the record was made on tin-foil, was short-lived; but in 1887 he greatly improved upon it by substituting wax as the recording medium, and in this form the instrument was a commercial success. He also developed an ingenious electrical method for making copies of existing records. In 1877 he made his preliminary experiments on electric lighting. He passed an electric current through carbon strips in air, and found that when heated to incandescence they at once became oxidized and crumbled to pieces. When placed in as good a vacuum as was obtainable with a common air-pump, however, the carbon strips remained intact for 10 to 15 minutes before they burnt out. Platinum and iridium wires were then tried, but it was found that the current required to produce incandescence was sufficient to melt them within a short time. The next step was to use a mercury vacuum pump and to heat the filament to incandescence while the bulb was being evacuated, in order to remove occluded oxygen. Finally, after much patient research work, a carbon filament was produced which could be maintained at a higher temperature than platinum wire and was more efficient as a light source. The filaments of the first electric lamps were made from carbonized cotton thread, but before manufacture could be begun on a large scale a more durable material had to be discovered. After exhaustive tests Edison hit upon the idea of using carbonized bamboo fibres, which he considered to be superior to all others for the purpose. During the course of these investigations he discovered the " Edison effect," later to be used by Fleming and Wehnelt as the principle of their rectifiers, and ultimately developing into the many forms of thermionic amplifying valves now in use. While the work on the incandescent lamp was still going on, Edison was engaged in planning his system of electric lighting and in improving the dynamo. He made use of a laminated armature core, insulated the commutator with mica, and increased the amount of iron in the field magnets. He also realized the advantage of using a high-speed steam engine direct-coupled to a single large generator unit. In 1880 he floated the Edison Electric Illuminating Co. of New York, which proposed to give a public supply of electricity by the newly developed feeder-and-main method of distribution, the energy being measured by the Edison electrolytic-type meter. The Edison system was adopted in the world's first central-station electric lighting plant, which was put into operation on Holborn Viaduct in 1882 and remained in continuous use for many years. The greater part of Edison's later life was spent in inventing improvements on existing appliances. He patented early forms of cinema cameras and projection lanterns, and evolved a new process for the reduction of magnetic iron ores. In 1909 he began to manufacture a nickel-iron storage battery having an alkaline electrolyte, the product of about 10 years' research work by himself and a selected staff. He was elected a Member of the Institution in 1911, and an Honorary Member in 1927.

MAX KAI ESSKILDSEN was born in Copenhagen on the 18th June, 1858, and died during a visit there on the 9th September, 1931. In 1878 he was appointed a probationer at the Great Northern Telegraph Co.'s Newcastle station, the following year attaining permanent employment. After a short stay in London, he was, in 1881, transferred to Nystad in Finland, where he spent 5 years, after which he returned to London, where he was destined to remain for the rest of his days. Having, in 1888, passed an electrical course, he regularly assisted at the cable factories, which particular work he continued after having, in 1894, been transferred to the engineering department of the London office. Here he gradually rose through all the grades, being appointed head of the department in 1905. He furthermore acted as joint manager of the London office from 1919 until 1923, when he was pensioned. This, however, did not mean complete retirement from work, as, until his death, he remained at the company's disposal for weekly consultations. He joined the Institution as an Associate in 1890, and became a Member in 1915.